

WHAT IS CLAIMED IS:

1. A control processor for executing a set of control tasks defining dynamic model-based interactive control of an industrial process, the control processor

5 comprising:

an embedded control task, performed at a relatively low execution priority status within the control processor, the embedded control task comprising a multivariable linear program including a set of output values corresponding to process setpoints; and

10 a set of control blocks, performed at a relatively high execution priority status within the control processor, the set of control blocks including regulatory control blocks having output values that are transmitted by the control processors to field devices coupled to the industrial process.

15 2. The control processor of claim 1 wherein the set of control blocks comprise supervisory control blocks.

3. The control processor of claim 2 wherein the supervisory control blocks include a multivariable control block including computer instructions facilitating
20 communication of data between the control processor and a workstation.

4. The control processor of claim 3 wherein the multivariable control block includes computer instructions for receiving and storing a process control model to be implemented by the embedded control task.

25 5. The control processor of claim 2 wherein the supervisory control blocks include at least one multivariable loop block including computer instructions for providing an input value for a regulatory control block.

30 6. The control processor of claim 5 wherein the regulatory control block is a PID block.

7. The control processor of claim 5 wherein the regulatory control block is a ratio block.

8. The control processor of claim 1 further comprising a repetition cycle
5 parameter specifying a period for re-commencing a cycle of the embedded task.

Sub
B1 }
9. The control processor of claim 8 wherein the set of control blocks includes a
supervisory control block including a sequence of instructions to determine when to
re-commence a cycle of the embedded task in accordance with a value specified by
10 the repetition cycle parameter.

10. The control processor of claim 1 further comprising a block processing cycle
parameter specifying a repetition period for re-commencing a cycle of executing the
set of control blocks.
15

11. The control processor of claim 10 further comprising a repetition cycle
parameter specifying a period for re-commencing a cycle of executing the embedded
control task.

20 12. The control processor of claim 11 wherein a period specified by the repetition
cycle parameter exceeds a period specified by the block processing cycle parameter.

13. A method for operating a control processor, in an industrial process control
environment, to establish operating values including a set of setpoint values and a set
25 of process control variables associated with control elements in a controlled industrial
process based upon a set of input variables including process variables provided to the
control processor and representing the present state of the controlled industrial
process, the method comprising the steps of:

executing at a lower execution priority, by the control processor, an embedded
30 multivariable control application including computer instructions facilitating
computing a setpoint value corresponding to a process control variable; and

executing at a higher execution priority, by the control processor, a set of control blocks including regulatory control blocks for receiving and storing a set of process variables representing the present state of a controlled process.

5 14. The method of claim 13 wherein the set of control blocks comprise supervisory control blocks.

Sub
B1 }
10 15. The method of claim 14 wherein the supervisory control blocks include a multivariable control block and further including the step of downloading data from a workstation to a database accessed by the multivariable control block.

15 16. The method of claim 15 further comprising the steps of receiving and storing, within the database accessed by the multivariable control block, a process control model to be implemented by the embedded multivariable control application.

20 17. The method of claim 14 wherein the supervisory control blocks include at least one multivariable loop block, and further comprising the step of providing an input value for a regulatory control block in accordance with execution of instructions and data associated with the at least one multivariable loop block.

25 18. The method of claim 17 wherein the regulatory control block is a PID block.

19. The method of claim 17 wherein the regulatory control block is a ratio block.

20 20. The method of claim 13 further comprising the step maintaining a repetition cycle parameter specifying a period for re-commencing a cycle of the embedded task.

25 21. The method of claim 20 wherein the set of control blocks includes a supervisory control block, and further comprising the step of determining, by the
30 supervisory control block, when to re-commence a cycle of the embedded multivariable control application in accordance with a value specified by the repetition cycle parameter.

22. The method of claim 13 further comprising the step of maintaining a block processing cycle parameter specifying a repetition period for re-commencing a cycle of executing the set of control blocks.

5

23. The method of claim 22 further comprising the step of maintaining a repetition cycle parameter specifying a period for re-commencing a cycle of executing the embedded control task.

24. The method of claim 23 wherein a period specified by the repetition cycle parameter exceeds a period specified by the block processing cycle parameter.

25. An industrial process control computer having multiple operating level including:

15 a background control program execution level wherein the process control computer executes an embedded multivariable process control application, the embedded control application including instructions for executing a multivariable linear program to generate a set of values corresponding to process control variable setpoints; and

20 a foreground control block execution level wherein the process control computer executes a set of control blocks, at a higher execution priority level than the background control program execution level, the set of control blocks including program instructions that, when executed, receive and store a set of process variable values representing the state of a controlled process.

25

26. A multi-level multivariable industrial process control program execution framework for an industrial control processor including:

30 a first cyclically executed sequence of instructions, repeatedly executed according to a first configurable repetition period and at a first level of execution priority, the first cyclically executed program executing a sequence of instructions including at least a set of instructions for calculating a setpoint value for a process control variable.

a second cyclically executed sequence of instructions, repeatedly executed according to a second repetition period and at a second level of execution priority, the second level of priority exceeding the first level of priority, and thus enabling the control processor to temporarily suspend execution of the first cyclically executed sequence of instructions in order to execute the second cyclically executed sequence of instructions.